

**Homework # 5- Due Tuesday 1/31/06, Assigned Tuesday  
1/24/06**

0. Read p. 62-70. Vocabulary: disjoint cycle notation, subgroup, alternating group, equivalence relation, isomorphism of groups, order of a group element, cyclic group

1. Exercise 3-25, 3-27, 3-28, 3-29.

2. Find a collection of eight permutations in  $S_4$  that is a subgroup isomorphic to the dihedral group  $D_4 = \{e, r, r^2, r^3, s, sr, sr^2, sr^3\}$ . Give an explicit isomorphism from  $D_4$  to the subgroup of  $S_4$ .

3. Recall that  $GL(n, \mathbb{R})$  denotes the group of invertible  $n \times n$  matrices with real entries. Prove that the collection of matrices with determinant  $\{\pm 1\}$  forms a subgroup of  $GL_n(\mathbb{R})$ .

4. Let  $C = \{\sigma \in S_6 \mid \sigma(1) = 2\}$ . Is  $C \leq S_6$ ? Explain?

5. Let  $V$  consist of the following four elements of  $S_4$ :

$$V = \{e, (12)(34), (13)(24), (14)(23)\}$$

On the last assignment you checked that  $V \leq S_4$ . Write down the six left cosets of  $V$  and the six right cosets.

6. Repeat Ex. 5 for

$$W = \{e, (12), (34), (12)(34)\}$$